

Notice of Allowability

Application N .

10/680,216

Examiner

Sharidan Carrillo

Applicant(s)

AOKI ET AL.

Art Unit

1746

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 10/08/2003.
2. ☒ The allowed claim(s) is/are 1-3 and 5-11.
3. ☒ The drawings filed on 08 October 2003 are accepted by the Examiner.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☒ All b) ☐ Some* c) ☐ None of the:
 1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date 10/08/2003
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.



SHARIDAN CARRILLO
PRIMARY EXAMINER

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.
2. Authorization for this examiner's amendment was given in a telephone interview with Mr. Joseph Ragusa on 1/6/05.

The application has been amended below:

Please cancel claims 4, 12 and 13 and amend claims 1-3, 5, 6, 10 and 11 as follows:

1. (Currently Amended) A method of ~~manufacturing~~ cleaning a semiconductor ~~device~~ substrate, comprising:

(a) cleaning in a Single Wafer Processing Equipment a surface of a semiconductor substrate not using ultra-pure water rinse, ~~but using a cleaning agent containing one of a~~ comprising spraying a chemical solution onto the semiconductor substrate while rotating said semiconductor substrate, the chemical solution ~~[[an]] having comprising a liquid~~ organic solvent as a main component and a vapor of said ~~solution~~ organic solvent.

2. (Currently Amended) The method according to claim 1, further comprising, before the step (a), ~~[[b]]~~ forming a film on said semiconductor substrate and ~~[[c]]~~ partially removing said film.

3. (Currently Amended) The method according to claim 1, further comprising, before the step (a), ~~[[d]]~~ depositing a metal film and an insulating film on the semiconductor substrate in this order and ~~[[e]]~~ partially removing said insulating film to expose at least a part of a surface of said metal film.

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4. (Cancelled).
5. (Currently Amended) The method according to claim ~~[[4]]~~ 1, wherein in the step ~~[[f)]~~ (a), [said cleaning ~~agent~~ is sprayed onto said surface of said semiconductor substrate while] a portion ~~to be~~ of said cleaning solution sprayed onto said surface is moved from a center of said substrate to a periphery of said substrate.
6. (Currently Amended) The method according to claim 1, wherein the step (a) is performed as a rinse step after wet ~~process using a chemical solution~~ processing and wherein the step (a) includes ~~[[g)]~~ simultaneously spraying a liquid having resistivity lower than that of pure water and said cleaning ~~agent~~ solution onto said surface of said substrate, and wherein in the step ~~[[g)]~~ (a), portions ~~to be sprayed with said cleaning agent and said liquid~~ of the liquid sprayed onto said surface are moved from a center of said substrate to a periphery of said substrate while ~~said portion to be sprayed with~~ portions of said cleaning agent is solution sprayed onto said surface are kept ~~nearer at a position at~~ said center of said substrate ~~than said portion to be sprayed with said liquid.~~
7. (Original) The method according to claim 1, wherein said semiconductor substrate is a silicon wafer.
8. (Original) The method according to claim 1, wherein said surface of said semiconductor substrate includes an exposed portion of a semiconductor material.
9. (Original) The method according to claim 1, wherein said surface of said semiconductor substrate includes an exposed portion of a metal material.
10. (Currently Amended) The method according to claim 1, wherein said organic solvent ~~contains at least one~~ is selected from the group consisting of isopropyl alcohol, ethylene glycol, cyclopentanone, methylethylketone and glycol ether.
11. (Currently Amended) The method according to claim 1, further comprising, after the step (a), ~~[[h)]~~ drying said surface of said semiconductor substrate by rotating said semiconductor substrate in an inert gas atmosphere.

Claims 12 and 13 (Cancelled).

3. The following is an examiner's statement of reasons for allowance: The prior art fails to teach or suggest cleaning a surface of a semiconductor substrate in a single wafer processing equipment, the cleaning does not use an ultra-pure water rinse and the cleaning comprising spraying a chemical solution onto the semiconductor substrate while rotating the semiconductor substrate, the chemical solution comprising a liquid organic solvent as a main component and a vapor of the organic solvent. The closest prior art is that of Tipping et al. (3957531) which teaches cleaning by immersing the article in a heated first liquid mixture. After immersion, the article is withdrawn through and out of the vapor zone, allowed to cool and then rinsed by a second liquid mixture derived by direct condensation of vapors from the vapor zone. The prior art teaches immersion and fails to teach spraying a chemical solution while rotating the substrate, wherein the chemical solution comprises a liquid organic solvent and vapor of said organic solvent.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Jung teaches a DI water rinse, followed by drying with IPA and nitrogen gas. Kwon et al. teach DI water rinse, followed by liquid IPA and drying with nitrogen.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sharidan Carrillo whose telephone number is 571-272-1297. The examiner can normally be reached on Monday-Thursday, 6:30-3:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael E. Barr can be reached on 571-272-1414. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Sharidan Carrillo
Primary Examiner
Art Unit 1746

bsc



SHARIDAN CARRILLO
PRIMARY EXAMINER